International Journal of Innovative Scientific Research
2024, Vol. 2, Issue 4, pp. 139-144

International Journal of
Innovative Scientific Research

Journal homepage: https://ijisr.net

Research paper

Design and Fabrication of Solar Fodder Harvester

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KEYWORDS

Crop cutter
Solar power
Fodder
Harvesting

ABSTRACT

India Today, agriculture especially in India to concentrate in some situation such as how to increase the productivity and profit how to reduce the cost and labor. The problem faced by farmers who work on small fields while harvesting crops as it takes a lot of time, labor and effect to cut the crops manually. Although harvesting machines are already available in the market but these are quite large and costly. To overcome these problems this project work deals with "design and fabrication of multi crop reaper machine". This machine targets the farmers and small scale land holders who have small land area. It is easy to fabricate, low cost and light weight. It has cutting blades which cut the crop in moving type of motion. A prototype has been developed which is easy to operate and can be used for efficient and effortless harvesting of crops. The model so constructed can be used by small scale famers for increasing their profits by decreasing labor and machinery cost. This model will offer a superior and cheap technique to decrease labor and difficulties in collecting crops. So we decided to design and fabricate the multicrop reaper machine.

1. Introduction

Hydrogels Agriculture is the backbone of India. In India agriculture farmers has facing serious challenge like insufficient agricultural labor, in highest working seasons but also in normal time. This is mainly for increased nonfarm job opportunities having higher wage, migration of labor force to cities and low status of agricultural labors in the society. In India two type of crop cutting like as manual method (conventional method) and mechanized type of crop cutter. The crop cutting is important stage in agriculture field. Currently Indian former used conventional method for crop cutting i.e. cutting crop manually using labor but this method is very lengthy and time consuming To design and analysis the crop cutting Machine which is help to the Indian farmer to small farm. It will reduce the cost of crop cutting in field. It will help to increase economical standard in Indian former. The design of the crop cutting machine will be presented by using CATIA software. This machine has the capability and the economic value for fulfilling the needs of farmers having small land holdings. This machine is cost effective and easy to maintain and repair for the farmers. The machine model is designed based on the demand for a compact and economical reaper

2. Objectives

- To design and fabricate multi crop fodder cutting machine
- To compare the cost estimation of manual work and machine work

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DOI 105281/ijisr-1431624

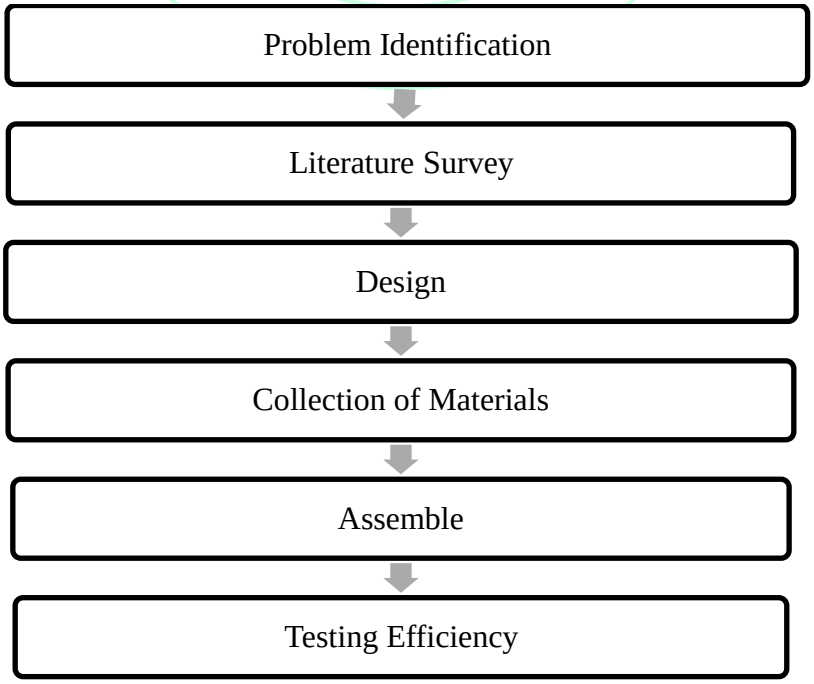
3. Literature Review

M. Sakthi et al. (2022) entitled as "Design and Fabrication of Semi Automatic Crop Cutter with Hybrid Power" said that agriculture especially in India to concentrate in some situation such as how to increase the productivity and profit, how to reduce the cost and labor to overcome these problems. This project work deals with "Design and fabrication of semi-automatic crop cutter with hybrid power" this machine targets the small scale farmers who have land area of less than two acres. It is compact and can cut up to four rows of crops. It has cutting blades which cut the crop in a moving type of motion. It is operated by the hybrid power setup for cutting the crop. It run on wheel power transmission and motor. A collecting mechanism is provide for collection of crops to inside of the collecting tank with help of belt conveyor. This compact crop cutter is manufactured using locally available spare and thus, it is costly maintainable. Time required for cutting crop is main importance. The use of machines can help for cutting at proper stage of crop maturity and reduce operation time. From this literature, we learned that the hybrid power is used as a source for machine operation.

M Patel et al. (2022) entitled as "Design and Fabrication of Agriculture Cutterprofessor" said that, problem faced by farmers who work on small fields while harvesting crops as it takes a lot a time, labour and effort to cut the crops manually. Although harvesting machines are already available in the market but these are quite large and costly. Since farmers with small lands have no such large usage and also harvesting is done on twice or thrice a year, it becomes difficult for small farmers to afford such kind of a machine. So it becomes essential to make a portable and cost efficient semi or full automatic crop cutting machine. To achieve this aim, a lot of ground research has been done in this project where in various farmers of our village were met and their problems were understood. Based on all findings a design for a crop cutting machine has been developed which is excepted to help small scale farmers. This model will offer a superior and cheap technique to decrease labour and endeavours required in collecting crops. From this literature, we learned that motor have been used to increase the operation speed.

Sachin Vivektyagi et al. (2020) entitled as "Design and Analysis of Universal Reaper Machine" said that In today scenario, man researches are done in the agriculture field and there is also a wide scope for more advancement in the technology. So therefore our objectives is to design and fabricate agricultural reaper machine which would be used to cutting various crops like wheat, rice, etc. The reaper machine is being designed to compensate the increasing demand of worker for harvesting of crops. The machine would cover a large area and will require a person for handling. The cad model is being prepared in SOLIDWORKS2018 considering AA 6063 tubes. In this machine 4 wheels are used, and considering various loads and forces the analysis of the machine has been done. The FEA has been done on SOLIDWORKS 2018 Software .From this literature, we learned that new technology of universal reaper machine have been used for the cutting operations.

4. Methodology



4.1 Problem Identification

To identify the problems in agriculture field which cause injury during the fodder crop harvesting and we find the solution for harvesting the fodder crops.

4.2 Literature Survey

Literature survey contain various studies carried out by different researchers related to the physical properties of reaper as well as different methods of machine Based on problem identification, we studied about various literatures for finding solution .

4.3 Design

We design the multi crop reaper machine from source of motor and battery We design the system for harvesting multi crop fodder.

4.4 Collection of Material

This part deals with the design and development of reaper machine for various crop. A developed reaper machine consists of motor, battery, hallow structural steel, tires, Cutting blade, conveyer chain, handle bar, charging adapter, wire, steel plate. The various factors involved in the development were operational safety, cost of production and availability of parts and easy of construction. The operation and adjustments were made simple so as to be used by the farmer.

4.5 Testing Efficiency

When a motor starts rotating using the electricity, the cutting blade connected to the motor starts rotating and cuts the fodder crops.

5. Components and their Properties

1. DC Motor.	2. Wires
3. Wheels	4. Cutting blades
5. Handle bar	6. Solar panel
7. Battery	8. Conveyer chain
9. Chain drive	10. Chain sprocket
11. Conveyer roller	12. Conveyer belt
13. Shaft	14. Ball bearing

5.1 DC Motor

DC motor is a kind of electric motor that uses an electromagnetic induction phenomenon. An alternating current drives this electric motor It is a type of electric current that periodically reverses direction and changes its magnitude continuously with time.

Fig. 1 DC Motor

5.2 Wires

Wire is a flexible strand of metal. Wire is commonly formed by drawing the metal through a bole in a die or draw plane. Wire gauges come in various expressed in terms of a gauge number of cross-sectional area Wires are wed to bear mechanical loads, often in the form of wire rope In electricity and telecommunications signals,

a "wire" can refer to an electrical cable, which can contain a "solid core" of s single wire or separate strands in stranded or braided forms.

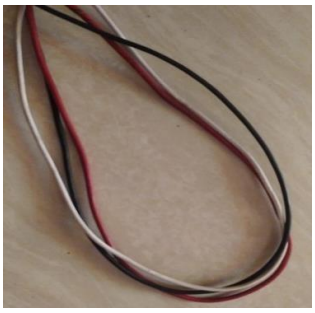


Fig. 2 Wires

5.3 Wheel

A wheel is a circular component that is intended to rotate on an axle bearing. The wheel is one of the key components of the wheel and axle which is one of the six simple machines. Wheels, in conjunction with axles, allow heavy objects to be moved easily facilitating movement or transportation while supporting a load, or performing labor in machines.

Fig. 3 Wheel

5.4 Cutting blades

A blade is the portion of a tool, weapon, or machine with an edge that is designed to puncture, chop, slice or scrape surfaces or materials.

Fig. 4 Cutting blades

5.5 Handle bar

To move the reaper machine in the desired direction and to hold the machine manually.Length-150mm, Breadth-300mm.

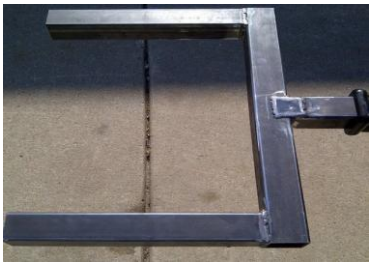


Fig. 5 Handle bar

5.6 Solar panel

A solar panel (photovoltaic module or photovoltaic panel) is a packaged interconnected assembly of solar cells, also known as photovoltaic cells. The solar panel is used as a component in a larger photovoltaic system to offer electricity for commercial and residential applications.

Fig. 6 Solar panel

6. Design and Fabrication Process

The fabrication process of a solar fodder harvester begins with careful planning and design finalization, where specifications and materials are outlined in a bill of materials (BOM). Once the design is approved, necessary tools and equipment are gathered. The next step involves acquiring materials such as aluminum or steel for the frame, high-carbon steel for cutting blades, and solar panels for energy generation. The frame is constructed by cutting materials to size and assembling them through welding or bolting, ensuring structural integrity. The cutting mechanism is then fabricated, with blades mounted securely to the frame. Following this, a collection system—either a conveyor belt or a basket—is integrated to gather the cut fodder. The solar power system is installed by mounting solar panels and connecting them to batteries and a charge controller. Mobility components, such as wheels or tracks, are added, along with a control panel for operation. After assembly, extensive testing is conducted to ensure functionality, followed by adjustments based on performance evaluations. Finally, the harvester is painted for protection, and documentation is created to guide users in operation and maintenance. This thorough process ensures the solar fodder harvester is efficient and ready for sustainable agricultural use.

7. Result and Discussion

This multi crop reaper machine has considerable potential to greatly increase productivity of crops. So, we are designing and fabricating a multi crop reaper machine which will do multiple operation simultaneously in Harvesting, threshing, Kaila carrying or transporting goods. The machine is successfully tested into farming field and reduces time and cost as compare to the traditional method. Less manpower needed to operate this machine ie. One person to operate solar fodder harvester study, you'd typically find detailed findings from the experiment or field test. This might include data on the efficiency of the harvester in terms of energy capture, crop yield, and any other relevant metrics. The discussion would then interpret these results, comparing them to existing literature, addressing any unexpected findings, and discussing the implications for future research or practical applications.

Fig. 7 Design for fabrication of solar fodder harvester

S. No	Methods	Duration / Area
1	Manual method	20 Mins / 3 Cents
2	Fodder Harvester	10 Mins / 3 Cents

8. Conclusion

Our main objective was to make simple, compact, efficient and low cost small scale harvester for small land holders. This machine fulfilled all objective and following conclusion Were drawn on based of work on the basis of literature review, all specification regarding Small scale harvester were meet. After assembling the Machine was tested on field for its efficiency and capability. The result got was as per our expectations from machine

A solar fodder harvester project would typically summarize the findings, outcomes, and potential future implications. It might include insights on the efficiency of the harvester, its environmental impact, feasibility for widespread adoption, and any challenges encountered during development or testing. Additionally, it might discuss avenues for further research or improvements to the technology.

Acknowledgements

The authors are highly thankful to Dr.A.Vivekanandhini Associate professor and Head, Department of Agriculture Engineering, Paavai Engineering College, Namakkal for providing the basic facilities and for valuable help and support during the study.

Funding Information

This research did not receive any specific grant from funding agencies in the public, commercial, or not- for-profit sectors

Declaration of Conflict

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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